SC03B-en3

Lenze

EN **Operating Instructions**

C0000

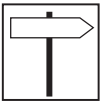
Copyright © 2005 AC Technology Corporation

All rights reserved. No part of this manual may be reproduced or transmitted in any form without written permission from AC Technology Corporation. The information and technical data in this manual are subject to change without notice. AC Technology Corporation makes no warranty of any kind with respect to this material, including, but not limited to, the implied warranties of it's merchantability and fitness for a given purpose. AC Technology Corporation assumes no responsibility for any errors that may appear in this manual.

All information given in this documentation has been carefully selected and tested for compliance with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. We do not accept any responsibility nor liability for damages that may occur. Any necessary corrections will be implemented in subsequent editions.

This document printed in the United States

Contents



About these instructions 2

1 Safety information 3
1.1 Pictographs used in these instructions 4

2 Technical data 5
2.1 Standards and application conditions 5
2.2 Ratings 6

3 Installation 7
3.1 Mechanical installation 7
3.1.1 Dimensions and mounting 7
3.2 Electrical installation 8
3.2.1 Installation according to EMC requirements 8
3.2.2 Fuses/cable cross-sections 8
3.2.3 Connection diagram 9
3.2.4 Control terminals 10

4 Commissioning 11
4.1 Parameter setting 11
4.2 Electronic programming module (EPM) 11
4.3 Parameter menu 12
4.4 CANopen mapping details 23
4.4.1 RPDO mapping details (h66 / h76) 23
4.4.2 TPDO mapping details (h86 / h96) 26
4.5 Quick CAN set-up 30

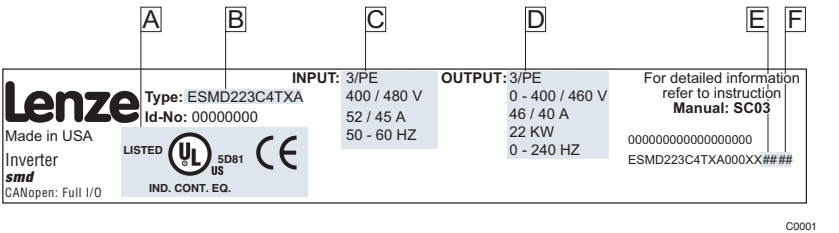
5 Troubleshooting and fault elimination 31

About these instructions

This documentation applies to the smd frequency inverter, and contains important technical data and describes installation, operation, and commissioning.

These instructions are only valid for smd frequency inverters with software rev 20 (see drive nameplate).

Please read the instructions before commissioning.



C0001

A Certifications
B Type
C Input Ratings
D Output Ratings
E Hardware Version
F Software Version

Scope of delivery	Important
• 1 ***smd*** inverter (ESMD...) with EPM installed (see Section 4.2) • 1 Operating Instructions	After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently. **Claim** • visible transport damage immediately to the forwarder. • visible deficiencies/incompleteness immediately to your Lenze representative.

© 2004 Lenze AG

No part of this documentation may be copied or made available to third parties without the explicit written approval of Lenze AG.

All information given in this documentation has been carefully selected and tested for compliance with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. We do not accept any responsibility nor liability for damages that may occur. Any necessary corrections will be implemented in subsequent editions.

1 Safety information

General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, moving and rotating. Some surfaces can be hot.

Non-authorized removal of the required cover, inappropriate use, and incorrect installation or operation creates the risk of severe injury to personnel or damage to equipment.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information, qualified skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

Application as directed

Drive controllers are components which are designed for installation in electrical systems or machinery. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with the EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. the starting of operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EEC).

The drive controllers meet the requirements of the Low Voltage Directive 73/23/EEC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

Note: The availability of controllers is restricted according to EN 61800-3.These products can cause radio interference in residential areas. In this case, special measures can be necessary.

Installation

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live drive controllers, applicable national regulations for the prevention of accidents (e.g. VBG 4) must be observed.

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

The documentation contains information about installation in compliance with EMC (shielding, grounding, filters and cables). These notes must also be observed for CE-marked controllers.

The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation.

Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). You are allowed to adapt the controller to your application as described in the documentation.

DANGER!

- After the controller has been disconnected from the supply voltage, live components and power connection must not be touched immediately, since capacitors could be charged. Please observe the corresponding notes on the controller.
- Do not continuously cycle input power to the controller more than once every three minutes.
- Please close all protective covers and doors during operation.

Note for UL approved system with integrated controllers

UL warnings are notes which apply to UL systems. The documentation contains special information about UL.

Warnings!

- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 V maximum (240 V devices) or 500 V maximum (400/500 V devices) respectively
- Use minimum 75 °C copper wire only.
- Shall be installed in a pollution degree 2 macro-environment.

1.1 Pictographs used in these instructions

Pictograph	Signal word	Meaning	Consequences if ignored
	DANGER!	Warning of Hazardous Electrical Voltage.	Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	WARNING!	Impending or possible danger for persons	Death or injury
	STOP!	Possible damage to equipment	Damage to drive system or its surroundings
	Note	Useful tip: If observed, it will make using the drive easier	

2 Technical data

2.1 Standards and application conditions

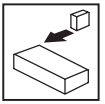
Conformity	CE	Low Voltage Directive (73/23/EEC)
Approvals	UL 508C	Underwriters Laboratories - Power Conversion Equipment
Max. permissible motor cable length [1]	shielded:	50 m (low-capacitance)
	unshielded:	100 m
Input voltage phase imbalance	≤ 2%	
Humidity	≤ 95% non-condensing	
Output frequency	0...240 Hz	
Environmental conditions	Class 3K3 to EN 50178	
Temperature range	Transport	-25 … +70 °C
	Storage	-20 … +70 °C
	Operation	0 … +55 °C (with 2.5 %/°C current derating above +40 °C)
Installation height	0 … 4000 m a.m.s.l. (with 5 %/1000 m current derating above 1000 m a.m.s.l.)	
Vibration resistance	acceleration resistant up to 0.7 g	
⚠ **Earth leakage current**	> 3.5 mA to PE	
Enclosure (EN 60529)	IP 20	
Protection measures against	short circuit, earth fault, overvoltage, motor stalling, motor overload	
Operation in public supply networks (Limitation of harmonic currents according to EN 61000-3-2)	Total power connected to the mains	Compliance with the requirements [2]
	< 0.5 kW	With mains choke
	0.5 … 1 kW	With active filter (in preparation)
	> 1 kW	Without additional measures

(1) For compliance with EMC regulations, the permissible cable lengths may change.
(2) The additional measures described only ensure that the controllers meet the requirements of the EN 61000-3-2. The machine/system manufacturer is responsible for the compliance with the regulations of the machine!

2.2 Ratings

Type	Power [kW]	Mains			Output Current [3]							
		Voltage, frequency	Current [A] [3]		I_N				I_{max} for 60 s			
					[A] [1]		[A] [2]		[A] [1]		[A] [2]	
			1~	3~	3~		3~		3~		3~	
ESMD371C2YXA	0.37	**1/N/PE 230 V** OR **3/PE 230 V** (180 V -0%…264 V +0%) 50/60 Hz (48 Hz -0%…62 Hz +0%)	4.7	2.7	2.2		2.0		3.3		3.0	
ESMD751C2YXA	0.75		8.4	4.8	4.0		3.7		6.0		5.6	
ESMD112C2YXA	1.1		12.0	6.9	6.0		5.5		9.0		8.3	
ESMD152C2YXA	1.5		12.9	7.9	6.8		6.3		10.2		9.5	
ESMD222C2YXA	2.2		17.1	10.8	9.6		8.8		14.4		13.2	
ESMD302C2TXA	3.0	**3/PE 230 V** (180 V -0%…264 V +0%) 50/60 Hz (48 Hz -0%…62 Hz +0%)		13.5	12.0		11.0		18.0		16.5	
ESMD402C2TXA	4.0			17.1	15.2		14.0		23		21	
ESMD552C2TXA	5.5			25	22		20		33		30	
ESMD752C2TXA	7.5			32	28		26		42		39	
ESMD113C2TXA	11			48	42		39		63		58	
ESMD153C2TXA	15			59	54		50		81		75	
			400V	**480V**	**400V**	**480V**	**400V**	**480V**	**400V**	**480V**	**400V**	**480V**
ESMD371C4TXA	0.37	**3/PE 400/480 V** (320 V -0%…528 V +0%) 50/60 Hz (48 Hz -0%…62 Hz +0%)	1.6	1.4	1.3	1.1	1.2	1.0	2.0	1.7	1.8	1.5
ESMD751C4TXA	0.75		3.0	2.5	2.5	2.1	2.3	1.9	3.8	3.2	3.5	2.9
ESMD112C4TXA	1.1		4.3	3.6	3.6	3.0	3.3	2.8	5.4	4.5	5.0	4.2
ESMD152C4TXA	1.5		4.8	4.0	4.1	3.4	3.8	3.1	6.2	5.1	5.7	4.7
ESMD222C4TXA	2.2		6.4	5.4	5.8	4.8	5.3	4.4	8.7	7.2	8.0	6.6
ESMD302C4TXA	3.0		8.3	7.0	7.6	6.3	7.0	5.8	11.4	9.5	10.5	8.7
ESMD402C4TXA	4.0		10.6	8.8	9.4	7.8	8.6	7.2	14.1	11.7	12.9	10.8
ESMD552C4TXA	5.5		14.2	12.4	12.6	11.0	11.6	10.1	18.9	16.5	17.4	15.2
ESMD752C4TXA	7.5		18.1	15.8	16.1	14.0	14.8	12.9	24	21	22	19.4
ESMD113C4TXA	11		27	24	24	21	22	19.3	36	32	34	29
ESMD153C4TXA	15		35	31	31	27	29	25	47	41	43	37
ESMD183C4TXA	18.5		44	38	39	34	36	31	59	51	54	47
ESMD223C4TXA	22		52	45	46	40	42	37	69	60	64	55

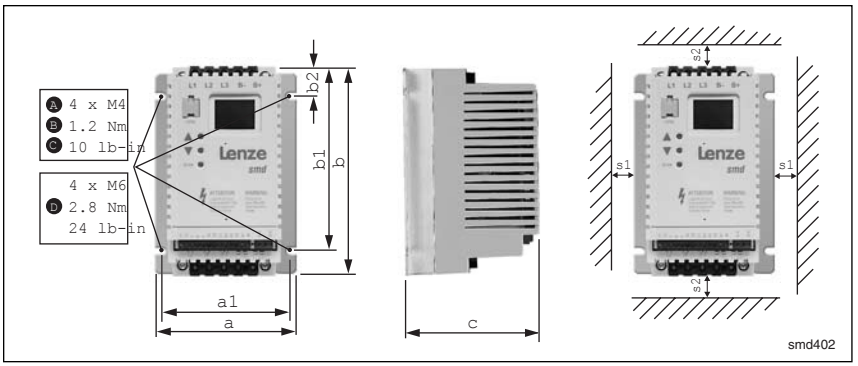
(1) For rated mains voltage and carrier frequencies 4, 6, and 8 kHz
(2) For rated mains voltage and carrier frequency 10 kHz
(3) Maximum current is a function of setting C90 (input voltage selection)



3 Installation

3.1 Mechanical installation

3.1.1 Dimensions and mounting



	Type	a [mm]	a1 [mm]	b [mm]	b1 [mm]	b2 [mm]	c [mm]	s1 [mm]	s2 [mm]	m [kg]
A	ESMD371C2YXA ESMD371C4TXA	93	84	146	128	17	100	15	50	0.6
A	ESMD751C2YXA ESMD751C4TXA	93	84	146	128	17	120	15	50	0.9
A	ESMD112C4TXA	93	84	146	128	17	146	15	50	1.0
B	ESMD112C2YXA ESMD152C4TXA, ESMD222C4TXA	114	105	146	128	17	133	15	50	1.4
B	ESMD152C2YXA, ESMD222C2YXA ESMD302C2TXA ESMD302C4TXA	114	105	146	128	17	171	15	50	2.0
B	ESMD402C2TXA ESMD402C4TXA, ESMD552C4TXA	114	105	146	100	17	171	15	50	2.0
C	ESMD552C2TXA, ESMD752C2TXA ESMD752C4TXA, ESMD113C4TXA	146	137	197	140	17	182	30	100	3.2
D	ESMD113C2TXA, ESMD153C2TXA ESMD153C4TXA... ESMD223C4TXA	195	183	248	183	23	203	30	100	6.4

WARNING!
Drives must not be installed where subjected to adverse environmental conditions such as: combustible, oily, or hazardous vapors or dust; excessive moisture; excessive vibration or excessive temperatures. Contact Lenze for more information.

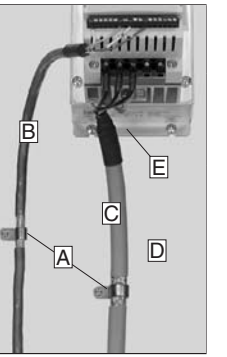
3.2 Electrical installation

3.2.1 Installation according to EMC requirements

EMC
Compliance with EN 61800-3/A11

Noise emission
Compliance with limit value class A according to EN 55011 if installed in a control cabinet with the appropriate footprint filter and the motor cable length does not exceed 10m

- A Screen clamps
- B Control cable
- C Low-capacitance motor cable (core/core ≤ 75 pF/m, core/screen ≤ 150 pF/m)
- D Electrically conductive mounting plate
- E Filter

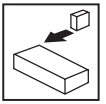


Tmd005

3.2.2 Fuses/cable cross-sections

Type		Recommendations(1)					E.l.c.b.(2)
		Fuse	Miniature circuit breaker(5)	Fuse (3) or Breaker(6) (N. America)	Input Power Wiring (L1, L2/N, L3, PE) [mm²]	[AWG]	
1/N/PE	ESMD371C2YXA	M10 A	C10 A	10 A	1.5	14	≥ 30 mA
	ESMD751C2YXA	M16 A	C16 A	15 A	2.5	14	
	ESMD112C2YXA	M20 A	C20 A	20 A	2.5	12	
	ESMD152C2YXA	M25 A	C25 A	25 A	2.5	12	
	ESMD222C2YXA	M30 A	C30A	30 A	4	10	
3/PE	ESMD371C2YXA ... ESMD751C2YXA ESMD371C4TXA ... ESMD222C4TXA	M10 A	C10 A	10 A	1.5	14	
	ESMD112C2YXA, ESMD152C2YXA ESMD302C4TXA	M12 A	C12 A	12 A	1.5	14	
	ESMD222C2YXA	M16 A	C16 A	15 A	2.5	12	
	ESMD402C4TXA	M16 A	C16 A	15 A	2.5	14	
	ESMD302C2TXA ESMD552C4TXA	M20 A	C20 A	20 A	2.5	12	
	ESMD402C2TXA ESMD752C4TXA	M25 A	C25 A	25 A	4	10	
	ESMD552C2TXA ESMD113C4TXA	M35 A	C35 A	35 A	6	8	
	ESMD752C2TXA ESMD153C4TXA	M45 A	C45 A	45 A	10	8	
	ESMD183C4TXA	M60 A	C60 A	60 A	16	6	
	ESMD113C2TXA ESMD223C4TXA	M70 A	C70 A	70 A	16	6	
	ESMD153C2TXA	M90 A	C90 A	90 A	16	4	

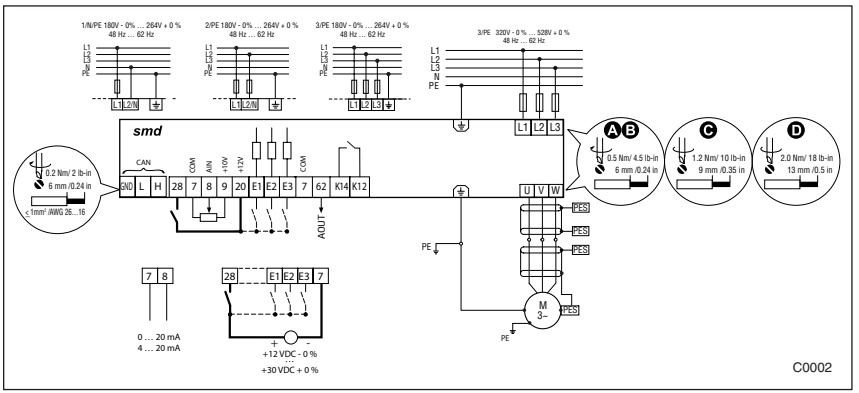
(1) Observe the applicable local regulations.
(2) Pulse-current or universal-current sensitive earth leakage circuit breaker.
(3) UL Class CC or T fast-acting current-limiting type fuses, 200,000 AIC, required. Bussman KTK-R, JJN, JJS or equivalent.
(4) Connection without end ferrules or with attached pin end connectors.
(5) Installations with high fault current due to large supply mains may require a type D circuit breaker.
(6) Thermomagnetic type breakers preferred.



Observe the following when using E.l.c.b:

- Installation of E.l.c.b only between supplying mains and controller.
- The E.l.c.b can be activated by:
  - capacitive leakage currents between the cable screens during operation (especially with long, screened motor cables)
  - connecting several controllers to the mains at the same time
  - RFI filters

3.2.3 Connection diagram



Danger!

- Hazard of electrical shock! Circuit potentials are up to 240 VAC above earth ground. Capacitors retain charge after power is removed. Disconnect power and wait until the voltage between B+ and B- is 0 VDC before servicing the drive.
- Do not connect mains power to the output terminals (U,V,W)! Severe damage to the drive will result.
- Do not cycle mains power more than once every three minutes. Damage to the drive will result.

3.2.4 Control terminals

Terminal	**Data for control connections** (printed in **bold** = Lenze setting)		
CAN_GND	CAN earth ground	For reliable communication make sure terminal CAN_GND is connected to CAN network GND/common. If only two wires are used (CAN_H and CAN_L) in the network, connect CAN_GND to chassis/earth ground.	
CAN_L	CAN low	If controller is located at either end of the network, a terminating resistor (120Ω typical) should be connected across CAN_L and CAN_H	
CAN_H	CAN high		
28	Digital input Start/Stop	LOW = Stop (**OFF**) HIGH = Run Enable	R_i = 3.3 kΩ
7	Reference potential		
8	Analog input **0 … 10 V** (changeable under C34)	input resistance: >50 kΩ (with current signal: 250Ω)	
9	Internal DC supply for setpoint potentiometer	+10 V, max. 10 mA	
20	Internal DC supply for digital inputs	+12 V, max. 20 mA	
E1	Digital input configurable with CE1 **Activate fixed setpoint 1 (JOG1)**	HIGH = JOG1 active	R_i = 3.3 kΩ
E2	Digital input configurable with CE2 **Direction of rotation**	LOW = CW rotation HIGH = CCW rotation	
E3	Digital input/output configurable with CE3 **Activate DC injection brake (DCB)**	HIGH = DCB active	
7	Reference potential		
62	Analog output configurable with c08 & c11		
K14	Relay output (normally-open contact) Configurable with C08 **Fault (TRIP)**	AC 250 V / 3 A DC 24 V / 2 A … 240 V / 0.22 A	
K12			

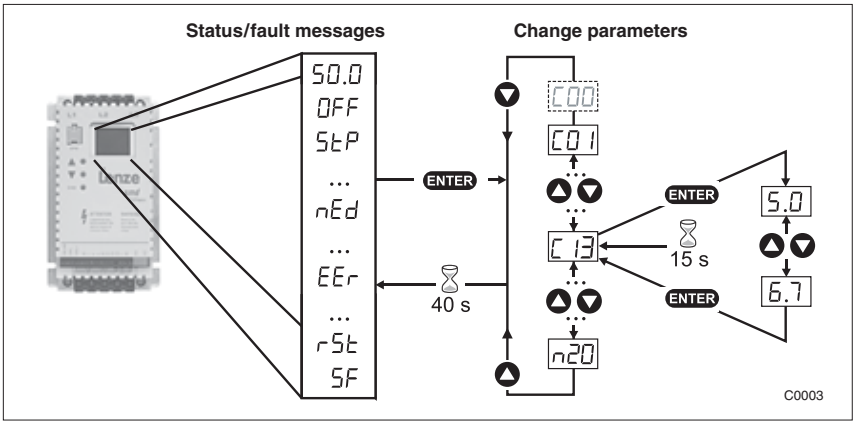
LOW = 0 … +3 V, HIGH = +12 … +30 V

Protection against contact

- All terminals have basic isolation (single insulating distance)
- Protection against contact can only be ensured by additional measures (i.e. double insulation)

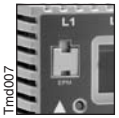
4 Commissioning

4.1 Parameter setting



NOTE
If the password function is enabled, the password must be entered into C00 to access the parameters. C00 will not appear unless the password function is enabled. See C94.

4.2 Electronic programming module (EPM)



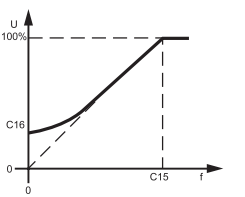
The EPM contains the controller's memory. Whenever parameter settings are changed, the values are stored in the EPM. It can be removed, but must be installed for the controller to operate (a missing EPM will trigger an **F I** fault). The controller ships with protective tape over the EPM that can be removed after installation.

An optional EPM Programmer (model EEPM1RA) is available that allows: the controller to be programmed without power; OEM settings to be default settings; fast copying of EPMs when multiple controllers require identical settings. It can also store up to 60 custom parameter files for even faster controller programming.

4.3 Parameter menu

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
C00	Password entry	0	0 ... 999	Visible only when password is active (see C94)
C01	Setpoint and control source	0	Setpoint source:	Control configuration:
			0 Analog input (terminal 8; see C34)	Control = terminals Programming = keypad/limited CANopen Monitoring = CANopen **Note:** RPDOs not processed in these modes
			1 Code c40	
			2 CANopen	Control = terminals Programming = CANopen/keypad Monitoring = CANopen **Note:** Only frequency setpoint part of RPDOs are processed in this mode
			3 CANopen	Control = CANopen Programming = CANopen/keypad Monitoring = CANopen
C02	Load Lenze setting		0 No action/loading complete	• C02 = 1...4 only possible with OFF or Inh • C02 = 2 : C11, C15 = 60 Hz
			1 Load 50 Hz Lenze settings	
			2 Load 60 Hz Lenze settings	
			3 Load OEM settings (if present)	
			4 Translate	
		WARNING! C02 = 1...3 overwrites all settings! TRIP circuitry may be disabled! Check codes CE1...CE3.		
		NOTE If an EPM that contains compatible data from a previous software version is installed, C02 = 4 converts the data to the current version.		

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
CE1	Configuration - Digital input E1	1	1 Activate fixed setpoint 1 (JOG1) 2 Activate fixed setpoint 2 (JOG2)	• Use C37...C39 to adjust fixed setpoints • Activate JOG3: Both terminals = HIGH
			3 DC braking (DCB)	See also C36
			4 Direction of rotation	LOW = CW rotation HIGH = CCW rotation
			5 Quick stop	Controlled deceleration to standstill, active LOW; Set decel rate in C13
			6 CW rotation	CW rotation = LOW and CCW rotation = LOW: Quick stop; Open-circuit protected
CE2	Configuration - Digital input E2	4	7 CCW rotation	
			8 UP (setpoint ramp-up) 9 DOWN (setpoint ramp-down)	UP = LOW and DOWN = LOW: Quick stop; Use momentary NC contacts
			10 TRIP set	Active LOW, triggers EEr (motor coasts to standstill) **NOTE:** NC thermal contact from the motor can be used to trigger this input
			11 TRIP reset	See also c70
			12 No action	can be used if Ex inputs are used only as CANopen digital inputs
CE3	Configuration - Digital input/output E3	3	1...12 (same as above) 13...19 (reserved) 20 Ready 21 Fault 22 Motor is running 23 Motor is running - CW rotation 24 Motor is running - CCW rotation 25 Output frequency = 0 Hz 26 Frequency setpoint reached 27 Threshold (C17) exceeded	• 1...11 configures terminal E3 as an input • 20...30 configures terminal E3 as a current-sourcing (PNP) output rated 12 VDC / 50 mA
			28 Current limit reached	• in either motor or generator mode
			29 Dynamic Braking	•
			30 CANopen Control	• output controlled by RPDO (h66,h76 = 4)
			Note A CFG fault will occur under the following conditions: • E1...E3 settings are duplicated (each setting can only be used once) • One input is set to UP and another is not set to DOWN, or vice-versa	
C08	Configuration - Relay output (terminals K14 and K12)	1	Relay is energized if 0 Ready 1 Fault 2 Motor is running 3 Motor is running - CW rotation 4 Motor is running - CCW rotation 5 Output frequency = 0 Hz 6 Frequency setpoint reached 7 Threshold (C17) exceeded	
			8 Current limit reached	in either motor or generator mode
			9 CANopen Control	Output controlled by RPDO (h66,h76 = 4)

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
C10	Minimum output frequency	0.0	0.0	{Hz}	240	• Output frequency at 0% analog setpoint • C10 not active for fixed setpoints or setpoint selection via c40
C11	Maximum output frequency	50.0	7.5	{Hz}	240	• Output frequency at 100% analog setpoint • C11 is never exceeded
			WARNING! Consult motor/machine manufacturer before operating above rated frequency. Overspeeding the motor/machine may cause damage to equipment and injury to personnel!			
C12	Acceleration time	5.0	0.0	{s}	999	• C12 = frequency change 0 Hz...C11 • C13 = frequency change C11...0 Hz • For S-ramp accel/decel, adjust c82
C13	Deceleration time	5.0	0.0	{s}	999	
C14	Operating Mode	2	0 Linear characteristic with Auto-Boost 1 Square-law characteristic with Auto-Boost 2 Linear characteristic with constant V_{min} boost 3 Square-law characteristic with constant V_{min} boost			• Linear characteristic: for standard applications • Square-law characteristic: for fans and pumps with square-law load characteristic • Auto boost: load-dependent output voltage for low-loss operation
C15	V/f reference point	50.0	25.0	{Hz}	999	 smd006
			Set the rated motor frequency (nameplate) for standard applications			
C16	V_{min} boost (optimization of torque behavior)	4.0	0.0	{%}	40.0	
			Set **after** commissioning: The unloaded motor should run at slip frequency (approx. 5 Hz), increase C16 until motor current (C54) = 0.8 x rated motor current			
C17	Frequency threshold (Q_{min})	0.0	0.0	{Hz}	240	See C08, selection 7 Reference: setpoint
C18	Chopper frequency	2	0 4 kHz 1 6 kHz 2 8 kHz 3 10 kHz			• As chopper frequency is increased, motor noise is decreased • Observe derating in Section 2.2 • Automatic derating to 4 kHz at 1.2 x I_r
C21	Slip compensation	0.0	0.0	{%}	40.0	Change C21 until the motor speed no longer changes between no load and maximum load
C22	Current limit	150	30	{%}	150	• When the limit value is reached, either the acceleration time increases or the output frequency decreases • When C90 = 2, max setting is 180%
			Reference: ***smd*** rated output current			
C24	Accel boost	0.0	0.0	{%}	20.0	Accel boost is only active during acceleration

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
C34	Configuration - analog input	0	0 0...10 V 1 0...5 V 2 0...20 mA 3 4...20 mA			
C36	Voltage - DC injection brake (DCB)	4.0	0.0	{%}	50.0	• See CE1...CE3 and c06 • Confirm motor suitability for use with DC braking
C37	Fixed setpoint 1 (JOG 1)	20.0	0.0	{Hz}	240	
C38	Fixed setpoint 2 (JOG 2)	30.0	0.0	{Hz}	240	
C39	Fixed setpoint 3 (JOG 3)	40.0	0.0	{Hz}	240	
C46	Frequency setpoint		0.0	{Hz}	240	Display: Setpoint via CANopen, analog input, or function UP/DOWN
C50	Output frequency		0.0	{Hz}	240	Display
C53	DC bus voltage		0.0	{%}	255	Display
C54	Motor current		0.0	{%}	255	Display
C87	Motor rated speed	1390	300	{RPM}	65000	Set to motor nameplate speed
C89	Motor rated frequency	50	10	{Hz}	1000	Set to motor nameplate frequency
C90	Input voltage selection		0 Auto			Automatically sets to Low (1) or High (2) upon next power-up, depending on input voltage
			1 Low			For 200 V or 400 V input
			2 High			For 240 V or 480 V input
		Note • To simplify commissioning, the Lenze setting is preset at the factory, depending on model: C90 = 1 for 400/480 V models C90 = 2 for 230/240 V models • Upon reset (C02 = 1, 2), C90 = 0. Confirm correct setting after next power-up.				
C94	User password	0	0 Changing from “0” (no password), value will start at 763		999	When set to a value other than 0, must enter password at C00 to access parameters
C99	Software version					Display, format: x.yz
c06	Holding time - automatic DC injection brake (Auto-DCB)	0.0	0.0 0.0 = not active 999 = continuous brake	{s}	999	• Automatic motor braking below 0.1 Hz by means of motor DC current for the entire holding time (afterwards: U, V, W inhibited) • Confirm motor suitability for use with DC braking
c08	Analog output scaling	100	1.0		999	When 10 VDC is output at terminal 62, it will equal this value (see c11)

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
c11	Configuration - Analog output (62)	0	0 None	
			1 Output frequency 0-10 VDC	Use c08 to scale signal
			2 Output frequency 2-10 VDC	**Example:** c11 = 1 and c08 = 100: At 50 Hz, terminal 62 = 5 VDC At 100 Hz, terminal 62 = 10 VDC
			3 Load 0-10 VDC	
			4 Load 2-10 VDC	
			5 CANopen Control	Value set by RPDO (h66,h76 = 4) (c08 not used for scaling)
c20	I²t switch-off (thermal motor monitoring)	100	30 {%} 100 100% = ***smd*** rated output current	• Triggers OC6 fault when motor current exceeds c20 for too long • Correct setting = (motor nameplate current) / (***smd*** output current rating) X 100% • **Example:** motor = 6.4 amps and ***smd*** = 7.0 amps; correct setting = 91% (6.4 / 7.0 = 0.91 x 100% = 91%)
		⚠	**WARNING!** Maximum setting is rated motor current (see nameplate). Does not provide full motor protection!	
c40	Frequency setpoint via keys ▲▼	0.0	0.0 {Hz} 240	Only active if C01 = 1
c42	Start condition (with mains on)	1	0 Start after LOW-HIGH change at terminal 28	See also c70
			1 Auto start if terminal 28 = HIGH	
		⚠	**WARNING!** Automatic starting/restarting may cause damage to equipment and/or injury to personnel! Automatic starting/restarting should only be used on equipment that is inaccessible to personnel.	
c60	Mode selection for c61	0	0 Monitoring only	c60 = 1 allows the keys ▲▼ to adjust speed setpoint (c40) while monitoring c61
			1 Monitoring and editing	
c61	Present status/error		status/error message	• Display • Refer to Section 5 for explanation of status and error messages
c62	Last error		error message	
c63	Last error but one			
c70	Configuration TRIP reset (error reset)	0	0 TRIP reset after LOW-HIGH change at terminal 28, mains switching, or after LOW-HIGH change at digital input “TRIP reset”	
			1 Auto-TRIP reset	• Auto-TRIP reset after the time set in c71 • More than 8 errors in 10 minutes will trigger rSt fault
		⚠	**WARNING!** Automatic starting/restarting may cause damage to equipment and/or injury to personnel! Automatic starting/restarting should only be used on equipment that is inaccessible to personnel.	
c71	Auto-TRIP reset delay	0.0	0.0 {s} 60.0	See c70

Code		Possible Settings		IMPORTANT
No.	Name	Lenze	Selection	
c78	Operating time counter		Display Total time in status “Start”	0...999 h: format xxx 1000...9999 h: format x.xx (x1000) 10000...99999 h: format xx.x (x1000)
c79	Mains connection time counter		Display Total time of mains = on	
CANopen / System bus parameters				
h42	Guard time	0	0 {ms} 65535	• h42 x h43 = node life time • If RTR frame with ID = 0x700 + Node ID (h50) is not received during the node life time, the controller will react according to h44 • If heart beat message is enabled, the guard function is disabled • h44 is only active when C01 = 3 and h42 x h43 > 0
h43	Life time factor	0	0 255	
h44	Guard time event reaction	0	0 Not active 1 Inhibit 2 Quick stop 3 Trip fault FC3	
h45	Error behavior	1	0 transition to pre-operational (only if current state is operational) 1 No state change 2 transition to stopped	Specifies action taken by the drive when it encounters a communication error (ex. Node guarding event or Bus Off)
h46	Message monitoring time	0	0 {ms} 65535	• h46 and h47 can be used to monitor all valid messages (e.g. SDO, SYNC, PDO...) • h46 = 0 or h47 = 0 disables message monitoring function • h47 is only active when C01 = 3
h47	Message monitoring time out reaction	0	0 Not active 1 Inhibit 2 Quick stop 3 Trip fault FC3	
h48	Monitoring timeout status		Bits: 0 Guard time timeout 1 No valid message received 2 RPD01 timeout 3 RPD02 timeout 4 CAN initialization fault	• Read-only • Indicates cause of FC3 fault, inhibit, or quick stop (depending on the settings of h44, h47, h65, h75)
			5 reserved 6 reserved 7 reserved	Bits 5…7 create a binary number from 0 to 7 indicating the number of overflows in the receive buffers (h49 bits 6 and 7)

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
h49	CAN controller status value (8-bit value)		0	Receive/transmit error warning flag (96 or more errors)	• Read-only • CAN warnings and errors
			1	Receive error warning flag (96 or more receive errors)	
			2	Transmit error warning flag (96 or more transmit errors)	
			3	Receive error passive flag (128 or more receive errors)	
			4	Transmit error passive flag (128 or more transmit errors)	
			5	Bus-off error flag	
			6	Receive buffer 0 overflow flag	
			7	Receive buffer 1 overflow flag	
h50[1]	CAN address (Node ID)	1	1	127	If h53 = 0, 1: maximum setting = 63
h51[1]	CAN baud rate	5	0	10 kbps (max distance = 5000m)	
			1	20 kbps (max distance = 2500m)	
			2	50 kbps (max distance = 1000m)	
			3	125 kbps (max distance = 500m)	
			4	250 kbps (max distance = 250m)	
			5	500 kbps (max distance = 100m)	
h52[1]	System bus participant	0	0	Slave	• h52 = 1: Controller enters operational state automatically • h52 = 2: Controller sends “NMT start all nodes” after boot-up time (h55) and enters operational state
			1	Slave with autostart enabled 0x1F80 NMT bootup - bit 2	
			2	System bus master (not NMT master)	
h53[1]	Parameter channel 2 (SDO#2)	0	0	Enable: Node ID range (1...63) with default COB ID for SYNC, RPDO, and TPDO	• h53 = 0, 1: CAN address 1...63; 64...127 used for SDO2 • SDO#1 COB ID = 1536 + Node ID • SDO#2 COB ID = 1600 + Node ID (if enabled)
			1	Enable: Node ID range (1...63) with programmable COB ID using h54, h60, h70, h80, h90	
			2	Disable: Node ID range (1...127) with default COB ID for SYNC, RPDO, and TPDO	
			3	Disable: Node ID range (1...127) with programmable COB ID using h54, h60, h70, h80, h90	
h54[1]	SYNC COB ID	128	0	2047	**Note:** Controller does not generate SYNC object
h55[1]	Boot up time	3000	0	{ms} 65535	Controller sends “NMT start all nodes” message after this delay (active only when h52 = 2)
h56	Heartbeat time	2000	0	{ms} 65535	• Producer heartbeat time • h56 = 0 disables heartbeat transmission

[1] These parameters take effect only after power-up, h58 reset, “NMT reset node”, or “NMT reset communication services”

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
h58	Reset CAN node	0	0	No action	On transition from 0 to 1, re-initializes CAN controller and activates changes made to parameters marked with (1)
			1	Reset CAN communication	
		WARNING! CAN re-initialization may activate new RPDO configurations, which can result in changes to present controller state, including starting.			
h59	CANopen status		0	Not initialized	• Read-only • **Note:** RPDOs and TPDOs are only active in operational state (h59 = 5)
			1	Initializing	
			2	Stopped	
			3	Pre-operational	
			4	reserved	
			5	Operational	
RPDO#1 configuration parameters					
h60(1)	RPDO#1 COB ID	513	0	2047	If h53 = 0, 2: Setting will change to 512 + Node ID during power-up or h58 reset.
h61(1)	RPDO#1 enable/ disable	1	0	Disable	
			1	Enable	
h62	RPDO#1 transmission type	255	0	255	• h62 = 0...240: transfer on every SYNC received. • h62 = 254, 255: immediate transfer
h64	RPDO#1 event monitoring timer	0	0	{ms} 65535	h64 = 0: monitoring disabled
h65	RPDO#1 time out reaction	0	0	Not active	Only active when C01 = 3
			1	Inhibit	
			2	Quick stop	
			3	Trip fault FC3	
h66(1)	RPDO#1 mapping (see RPDO mapping details)	0	0	C0135 control word + C46 signed	C46 scaling: ± 50 = ± 1.0 Hz
			1	C0135 control word + C46 unsigned	C46 scaling: 10 = 1.0 Hz
			2	402 Drives and Motion Control: PDO Controlword 0x6040	
			3	402 Drives and Motion Control: PDO Controlword 0x6040 + vl target velocity 0x6042	• vl target velocity units = signed RPM • RPM calculation based on C87 and C89
			4	C0135 Controlword + C46 signed and scaled + Digital output + analog output	C46 scaling: +/- 16384 = C11
h69	RPDO#1 status		0	255	• Read-only • Number of received RPDO#1 messages • Above 255, starts over at 0

(1) These parameters take effect only after power-up, h58 reset, “NMT reset node”, or “NMT reset communication services”

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
RPDO#2 configuration parameters					
h70[1]	RPDO#2 COB ID	769	0	2047	If h53 = 0, 2: Setting will change to 768 + Node ID during power-up or h58 reset.
h71[1]	RPDO#2 enable/ disable	0	0	Disable	
			1	Enable	
h72	RPDO#2 transmission type	255	0	255	• h72 = 0...240: transfer on every SYNC received • h72 = 254, 255: immediate transfer
h74	RPDO#2 event monitoring timer	0	0 {ms}	65535	h74 = 0: monitoring disabled
h75	RPDO#2 time out reaction	0	0	Not active	Only active when C01 = 3
			1	Inhibit	
			2	Quick stop	
			3	Trip fault FC3	
h76[1]	RPDO#2 mapping (see RPDO mapping details)	0	0	C0135 control word + C46 signed	C46 scaling: ± 50 = ± 1.0 Hz
			1	C0135 control word + C46 unsigned	C46 scaling: 10 = 1.0 Hz
			2	402 Drives and Motion Control: PDO Controlword 0x6040	
			3	402 Drives and Motion Control: PDO Controlword 0x6040 + vl target velocity 0x6042	• vl target velocity units = signed RPM • RPM calculation based on C87 and C89
			4	C0135 Controlword + C46 signed and scaled + Digital output + analog output	C46 scaling: +/- 16384 = C11
h79	RPDO#2 status		0	255	• Read-only • Number of received RPDO#2 messages • Above 255, starts over at 0
TPDO#1 configuration parameters					
h80[1]	TPDO#1 COB ID	385	0	2047	If h53 = 0, 2: Setting will change to 384 + Node ID during power-up or h58 reset.
h81[1]	TPDO#1 enable/ disable	1	0	Disable	
			1	Enable (no RTR)	
			2	Enable (with RTR)	Enable individual polling of TPDO#1
h82	TPDO#1 transmission type	255	0	255	• h82 = 0...240: Transmit TPDO#1 after every nth SYNC received + Event + RTR (if enabled) • h82 = 253: Event + RTR (if enabled) • h82 = 254: COS triggered (WORD0 of TPDO#1) + Event + RTR (if enabled) • h82 = 255: Event + RTR (if enabled)

[1] These parameters take effect only after power-up, h58 reset, “NMT reset node”, or “NMT reset communication services”

Code		Possible Settings				IMPORTANT
No.	Name	Lenze	Selection			
h83[1]	TPDO#1 inhibit time	50	0	{0.1 ms}	65535	Sets minimum time between TPDO#1 transmissions (h83 = 50 = 5.0 ms)
h84	TPDO#1 event timer	0	0	{ms}	65535	• Sets the fixed interval for TPDO#1 transmission • h84 = 0: disables event timer
h86[1]	TPDO#1 mapping (see TPDO mapping details)	0	0	C0150 + C50 signed		C50 scaling: ± 50 = ± 1.0 Hz
			1	C0150 + C50 unsigned		C50 scaling: 10 = 1.0 Hz
			2	Controller status in C0135 format + frequency setpoint signed		Can be used to control other controllers (see example in section 4.5)
			3	Controller status in C0135 format + frequency setpoint unsigned		
			4	402 Device profile: Statusword 0x6041		
			5	402 Device profile: Statusword 0x6041 + vl control effort 0x6044		• vl control effort units = signed RPM • RPM calculation based on C87 and C89
			6	C0150 + C50 signed and scaled + digital input + analog input		C50 scaling: +/- 16384 = C11
h87	TPDO#1 WORD0 bit mask	65535	0		65535	• COS (change of state) bit mask applied to WORD0 of TPDO selected by h86. • h87 = 65535: activates all bits of WORD0 for COS triggering • h87 = 0: disables COS triggering
h89	TPDO#1 status		0		255	• Read-only • Number of transmitted TPDO#1 messages • Above 255, starts over at 0
TPDO#2 configuration parameters						
h90[1]	TPDO#2 COB ID	641	0		2047	If h53 = 0, 2: Setting will change to 640 + Node ID during power-up or h58 reset.
h91[1]	TPDO#2 enable/ disable	0	0	Disable		
			1	Enable (no RTR)		
			2	Enable (with RTR)		Enable individual polling of TPDO#2
h92	TPDO#2 transmission type	255	0		255	• h92 = 0...240: Transmit TPDO#2 after every nth SYNC received + Event + RTR (if enabled) • h92 = 253: Event + RTR (if enabled) • h92 = 254: COS triggered (WORD0 of TPDO#2) + Event + RTR (if enabled) • h92 = 255: Event + RTR (if enabled)
h93[1]	TPDO#2 inhibit time	50	0	{0.1 ms}	65535	Sets minimum time between TPDO#2 transmissions (h93 = 50 = 5.0 ms)
h94	TPDO#2 event timer	0	0	{ms}	65535	• Sets the fixed interval for TPDO#2 transmission • h94 = 0: disables event timer

[1] These parameters take effect only after power-up, h58 reset, “NMT reset node”, or “NMT reset communication services”

Code		Possible Settings			IMPORTANT
No.	Name	Lenze	Selection		
h96[1]	TPDO#2 mapping (see TPDO mapping details)	0	0	C0150 + C50 signed	C50 scaling: ± 50 = ± 1.0 Hz
			1	C0150 + C50 unsigned	C50 scaling: 10 = 1.0 Hz
			2	Controller status in C0135 format + frequency setpoint signed	Can be used to control other controllers (see example in section 4.5)
			3	Controller status in C0135 format + frequency setpoint unsigned	
			4	402 Device profile: Statusword 0x6041	
			5	402 Device profile: Statusword 0x6041 + vl control effort 0x6044	• vl control effort units = signed RPM • RPM calculation based on C87 and C89
			6	C0150 + C50 signed and scaled + digital input + analog input	C50 scaling: +/- 16384 = C11
h97	TPDO#2 WORD0 bit mask	65535	0	65535	• COS (change of state) bit mask applied to WORD0 of TPDO selected by h96. • h97 = 65535: activates all bits of WORD0 for COS triggering • h97 = 0: disables COS triggering
h99	TPDO#2 status		0	255	• Read-only • Number of transmitted TPDO#2 messages • Above 255, starts over at 0
n20	Power up state	0	0	Quick stop	Selects controller power up state when C01 = 3 (CANopen control)
			1	Inhibit	

[1] These parameters take effect only after power-up, h58 reset, “NMT reset node”, or “NMT reset communication services”

4.4 CANopen mapping details

4.4.1 RPDO mapping details (h66 / h76)

	Bit	h66 / h76 setting = 0
WORD0 - C0135 control word	0	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	1	
	2	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	3	Quick stop 0 = Quick stop not active 1 = Quick stop active
	4	reserved
	5	reserved
	6	reserved
	7	reserved
	8	reserved
	9	Controller inhibit 0 = No controller inhibit 1 = Controller inhibit
	10	reserved
	11	TRIP reset TRIP reset on transition from 0 to 1
	12	reserved
	13	reserved
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1	• Signed frequency setpoint written to C46 • Frequency setpoint [Hz] = WORD1 value / 50 • Example 1: Requested setpoint = CW at 34.5 Hz = 34.5 x 50 = 1725 = 0x06BD • Example 2: Requested setpoint = CCW at 44.5 Hz = - (44.5 x 50) = -2225 = 0xF74F **Note:** Setpoint sign overrides Bit 2 in WORD0	
WORD2	reserved (not evaluated)	
WORD3	reserved (not evaluated)	

	Bit	h66 / h76 setting = 1
WORD0 - C0135 control word	0	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	1	
	2	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	3	Quick stop 0 = Quick stop not active 1 = Quick stop active
	4	reserved
	5	reserved
	6	reserved
	7	reserved
	8	reserved
	9	Controller inhibit 0 = No controller inhibit 1 = Controller inhibit
	10	reserved
	11	TRIP reset TRIP reset on transition from 0 to 1
	12	reserved
	13	reserved
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1	• Unsigned frequency setpoint written to C46 • Frequency setpoint [Hz] = WORD1 value / 10 • Example: Requested setpoint = CW at 34.5 Hz = 34.5 x 10 = 0x0159 • Direction is set by bit 2 in WORD0	

	Bit	h66 / h76 setting = 2
WORD0 - Controlword 0x6040	0	0 = switch off[2] 1 = switch on
	1	0 = disable voltage[2] 1 = enable voltage
	2	0 = execute quick stop 1 = not quick stop
	3	0 = inhibit[2] 1 = enable
	4	reserved
	5	reserved
	6	reserved
	7	fault reset on transition from 0 to 1
	8	0 = execute motion 1 = halt[2]
	9	reserved
	10	reserved
	11	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	12	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	13	
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved

	Bit	h66 / h76 setting = 3
WORD0 - Controlword 0x6040	0	0 = switch off[2] 1 = switch on
	1	0 = disable voltage[2] 1 = enable voltage
	2	0 = execute quick stop 1 = not quick stop
	3	0 = inhibit[2] 1 = enable
	4	reserved
	5	reserved
	6	reserved
	7	fault reset on transition from 0 to 1
	8	0 = execute motion 1 = halt[2]
	9	reserved
	10	reserved
	11	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	12	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	13	
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1		• Signed vl target velocity 0x6042 (RPM) • RPM is calculated based on C87 and C89 • Example 1 (C87 = 1390 RPM, C89 = 50 Hz): Requested setpoint CW at 25.0 Hz = 25.0 x 1390/50 = 695 = 0x02B7 • Example 2 (C87 = 1390 RPM, C89 = 50 Hz): Requested setpoint CCW 44.5 Hz = - (44.5 x 1390/50) = - 1237 = 0xFB2B

[2] Implemented as inhibit; all indicated bits must be in opposite state for controller to be enabled.

	Bit	h66 / h76 setting = 4
WORD0 - C0135 control word	0	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	1	
	2	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	3	Quick stop 0 = Quick stop not active 1 = Quick stop active
	4	reserved
	5	reserved
	6	reserved
	7	reserved
	8	reserved
	9	Controller inhibit 0 = No controller inhibit 1 = Controller inhibit
	10	reserved
	11	TRIP reset TRIP reset on transition from 0 to 1
	12	reserved
	13	reserved
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1	• Speed signed scaled +/- 16384 == C11 (max frequency) • **Example 1:** Requested setpoint = CW at 34.5 Hz and C11 = 50.0Hz: Setpoint = roundup(34.5 * 16384/50) = 11305 = 0x2C29 • **Example 2:** Requested setpoint = CCW at 44.5 Hz and C11 = 50.0Hz: = - roundup(44.5 * 16384/50) = -14582 = 0xC70A **Note:** Setpoint sign overrides Bit 2 in WORD0	
WORD2	Digital outputs (RELAY + E3) • Bit 0 - RELAY - (if C08 set to selection 9) • Bit 1 - E3 (if CE3 set to selection 30)	
WORD3	Analog output 0-1000 -- corresponds to 0-10V ex. 600 -> 6.0V (if c11 set to selection 5)	

4.4.2 TPDO mapping details (h86 / h96)

	Bit	h86 / h96 setting = 0
WORD0 - C0150 Status word	0	reserved
	1	0 = Pulses to power stage enabled 1 = Pulses to power stage Inhibited
	2	0 = Current limit not reached 1 = Current limit reached
	3	reserved
	4	0 = Actual frequency < > setpoint 1 = Actual frequency = setpoint
	5	0 = Not above threshold (C17) 1 = Above threshold (C17)
	6	0 = Actual frequency < > 0 Hz 1 = Actual frequency = 0 Hz
	7	0 = No controller inhibit 1 = Controller inhibit
	8	Controller status 0 = no fault 8 = fault present
	9	
	10	
	11	
	12	0 = No overtemperature warning 1 = Overtemperature warning
	13	0 = No DC bus overvoltage 1 = DC bus overvoltage
	14	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	15	0 = Not ready 1 = Ready (no faults)
WORD1		• Signed output frequency read from C50 • Scaling = C50 x 50 • Example 1: CW at 34.5 Hz = 34.5 x 50 = 1725 = 0x06BD • Example 2: CCW at 44.5 Hz = - (44.5 x 50) = - 2225 = 0xF74F
WORD2		reserved
WORD3		reserved

	Bit	h86 / h96 setting = 1
WORD0 - C0150 Status word	0	reserved
	1	0 = Pulses to power stage enabled 1 = Pulses to power stage Inhibited
	2	0 = Current limit not reached 1 = Current limit reached
	3	reserved
	4	0 = Actual frequency < > setpoint 1 = Actual frequency = setpoint
	5	0 = Not above threshold (C17) 1 = Above threshold (C17)
	6	0 = Actual frequency < > 0 Hz 1 = Actual frequency = 0 Hz
	7	0 = No controller inhibit 1 = Controller inhibit
	8	Controller status 0 = no fault 8 = fault present
	9	
	10	
	11	
	12	0 = No overtemperature warning 1 = Overtemperature warning
	13	0 = No DC bus overvoltage 1 = DC bus overvoltage
	14	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	15	0 = Not ready 1 = Ready (no faults)
WORD1		• Unsigned output frequency read from C50 • Scaling = C50 x 10 • Example: CW at 34.5 Hz = 34.5 x 10 = 345 = 0x0159 • Direction is indicated by bit 14 in WORD0

	Bit	h86 / h96 setting = 2
WORD0 - Controller status in C0135 format	0	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	1	
	2	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	3	Quick stop 0 = Quick stop not active 1 = Quick stop active
	4	reserved
	5	reserved
	6	reserved
	7	reserved
	8	reserved
	9	Controller inhibit 0 = No controller inhibit 1 = Controller inhibit
	10	reserved
	11	TRIP reset 0 = No TRIP reset 1 = TRIP reset
	12	reserved
	13	reserved
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1		• Signed frequency setpoint [Hz] • Scaling = frequency setpoint [Hz] x 50 • Example 1: CW at 34.5 Hz = 34.5 x 50 = 1725 = 0x06BD • Example 2: CCW at 44.5 Hz = - (44.5 x 50) = - 2225 = 0xF74F
WORD2		reserved
WORD3		reserved

	Bit	h86 / h96 setting = 3
WORD0 - Controller status in C0135 format	0	JOG1, JOG2, JOG3 0 = C46 active 1 = JOG1 (C37) active 2 = JOG2 (C38) active 3 = JOG3 (C39) active
	1	
	2	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	3	Quick stop 0 = Quick stop not active 1 = Quick stop active
	4	reserved
	5	reserved
	6	reserved
	7	reserved
	8	reserved
	9	Controller inhibit 0 = No controller inhibit 1 = Controller inhibit
	10	reserved
	11	TRIP reset 0 = No TRIP reset 1 = TRIP reset
	12	reserved
	13	reserved
	14	DC brake 0 = DC brake not active 1 = DC brake active
	15	reserved
WORD1		• Unsigned frequency setpoint [Hz] • Scaling = frequency setpoint [Hz] x 10 • Example: CW at 34.5 Hz = 34.5 x 10 = 345 = 0x0159 • Direction is indicated by bit 2 in WORD0

	Bit	h86 / h96 setting = 4
WORD0 - Statusword 0x6041	0	0 = Not ready to switch on 1 = Ready to switch on
	1	0 = Not switched on 1 = Switched on
	2	0 = operation disabled 1 = operation enabled
	3	0 = No fault 1 = Fault
	4	0 = Voltage disabled 1 = Voltage enabled **Note:** On smd controller, this is always enabled
	5	0 = Quick stop active 1 = Quick stop not active
	6	Switch on disabled On smd controller this is always 0 (switch on enabled)
	7	0 = No warning 1= Warning
	8	Manufacturer specific
	9	Remote 0 = C01 < > 2 and 3 1 = C01 = 2 or 3
	10	Target reached 0 = Setpoint not reached 1 = Setpoint reached
	11	Internal limit 0 = Internal limit not active 1 = Internal limit active
	12	reserved
	13	reserved
	14	reserved
	15	reserved

	Bit	h86 / h96 setting = 5
WORD0- Statusword 0x6041	0	0 = Not ready to switch on 1 = Ready to switch on
	1	0 = Not switched on 1 = Switched on
	2	0 = operation disabled 1 = operation enabled
	3	0 = No fault 1 = Fault
	4	0 = Voltage disabled 1 = Voltage enabled **Note:** On smd controller, this is always enabled
	5	0 = Quick stop active 1 = Quick stop not active
	6	Switch on disabled On smd controller this is always 0 (switch on enabled)
	7	0 = No warning 1= Warning
	8	Manufacturer specific
	9	Remote 0 = C01 < > 2 and 3 1 = C01 = 2 or 3
	10	Target reached 0 = Setpoint not reached 1 = Setpoint reached
	11	Internal limit 0 = Internal limit not active 1 = Internal limit active
	12	reserved
	13	reserved
	14	reserved
	15	reserved
WORD1	• Signed output frequency read from C50 • RPM is calculated based on C50, C87, and C89 • Example 1 (C87 = 1390 RPM, C89 = 50 Hz): CW at 25.0 Hz = 25.0 x 1390/50 = 695 = 0x02B7 • Example 2 (C87 = 1390 RPM, C89 = 50 Hz): CCW at 44.5 Hz = - (44.5 x 1390/50) = - 1237 = 0xFB2B	

	Bit	h86 / h96 setting = 6
WORD0 - C0150 Status word	0	reserved
	1	0 = Pulses to power stage enabled 1 = Pulses to power stage Inhibited
	2	0 = Current limit not reached 1 = Current limit reached
	3	reserved
	4	0 = Actual frequency < > setpoint 1 = Actual frequency = setpoint
	5	0 = Not above threshold 1 = Above threshold (C17)
	6	0 = Actual frequency < > 0 Hz 1 = Actual frequency = 0 Hz
	7	0 = No controller inhibit 1 = Controller inhibit
	8	Controller status 0 = no fault 8 = fault present
	9	
	10	
	11	
	12	0 = No overtemperature warning 1 = Overtemperature warning
	13	0 = No DC bus overvoltage 1 = DC bus overvoltage
	14	Direction of rotation 0 = CW (forward) 1 = CCW (reverse)
	15	0 = Not ready 1 = Ready (no faults)
WORD1		• Signed output frequency read from C50 signed scaled +/- 16384 = C11 (max frequency) • Scaling = C50*16384/C11 • **Example 1**: WORD1 = 0x2C29, C11 = 50.0Hz Direction = Sign(0x2C29) = CW Frequency = ABS(0x2C29) * C11 /16384 = 11305*50/16384 = **34.5 Hz CW** • **Example 2**: WORD1 = 0xC70A, C11 = 50.0Hz Direction = Sign(0xC70A) = CCW Frequency = ABS(0xC70A) * C11 /16384 = 14582*50/16384 = 44.5 **Hz CCW**
WORD2		Digital inputs status (TB28,E1,E2,E3) • Bit 0 - TB28 state (1 - asserted) • Bit 1 - E1 state (1 - asserted) • Bit 2 - E2 state (1 - asserted) • Bit 3 - E3 state (1 - asserted)
WORD3		Analog input value 0-1000 -- corresponds to 0-10V ex. 400 -> 4.00V

4.5 Quick CAN set-up

1. Power up the controller and set h50 (CAN address) and h51 (CAN baud rate) to appropriate values.
2. Power down the controller and connect the communication cable. For reliable communication make sure terminal CAN_GND is connected to CAN network GND/ common. If only two wires are used (CAN_H and CAN_L) in the network, connect CAN_GND to chassis/earth ground.
3. Power up the controller.
4. Use Global Drive Control Software to configure the required operation of the controller.

Example: Controller #2 needs to follow the operation of controller #1 (start/stop, speed, etc). Controller #1 can be controlled by CANopen or traditional control elements (relays, etc).

Controller #1 configuration		
No.	**Name**	**Setting**
h50	CAN address (Node ID)	1
h51	CAN baud rate	5 500 kbps
h52	System bus participant	1 Slave with autostart enabled
h53	Parameter channel 2 (SDO#2)	0 Enable with default COB ID
h84	TPDO#1 event timer	10 ms
h86	TPDO#1 mapping	3 Controller status in C0135 format + frequency setpoint unsigned

Controller #2 configuration		
No.	**Name**	**Setting**
C01	Setpoint source	3 CANopen control
h45	Error behavior	1 No state change
h50	CAN address (Node ID)	2
h51	CAN baud rate	5 500 kbps
h52	System bus participant	1 Slave with autostart enabled
h53	Parameter channel 2 (SDO#2)	1 Enable with prog. COB ID
h60	RPDO#1 COB ID	385 (h80 from controller #1)
h64	RPDO#1 event monitoring timer	50 ms
h65	RPDO#1 time out reaction	1 Inhibit
h66	RPDO#1 mapping	1 C0135 control word + C46 frequency setpoint unsigned

After setting the parameters, perform Node reset using parameter h58 or cycle the power.

After these controllers are configured as above, controller #2 will follow the operation of controller #1 including: Inhibit state, Quick Stop, DC brake, JOG speed selections, direction, and speed. For additional safety, controller #2 will transition to inhibit state if valid PDO is not received from controller #1 within 50ms.

5 Troubleshooting and fault elimination

Status		Cause	Remedy
e.g. 50.0	Present output frequency	Trouble free operation	
OFF	Stop (outputs U, V, W inhibited)	LOW signal at terminal 28	Set terminal 28 to HIGH
Inh	Inhibit (outputs U, V, W inhibited)	Controller is set up for CANopen operation (see C01)	Start the controller via CANopen
StP	Output frequency = 0 Hz (outputs U, V, W inhibited)	Setpoint = 0 Hz (C31 = 0)	Setpoint selection
		Quick stop activated through digital input	Deactivate Quick stop
br	DC-injection brake active	DC-injection brake activated • via digital input • automatically	Deactivate DC-injection brake • digital input = LOW • automatically after holding time c06 has expired
CL	Current limit reached	Controllable overload	Automatically (see C22)
LU	Undervoltage on DC bus	Mains voltage too low	Check mains voltage
dEC	Overvoltage on DC bus during deceleration (warning)	Excessively short deceleration time (C13)	Automatically if overvoltage < 1 s, OU, if overvoltage > 1 s
nEd	No access to code	Can only be changed when the controller is in OFF or Inh	Set terminal 28 to LOW or inhibit through CANopen

Error		Cause	Remedy (1)
cF	Data on EPM not valid	Data not valid for controller	• Use EPM providing valid data • Load Lenze setting
CF		Data error	
GF		OEM data not valid	
F I	EPM error	EPM missing or defective	Power down and replace EPM
CFG	Digital inputs not uniquely assigned	E1...E3 assigned with the same digital signals	Each digital signal can only be used once
		Either just “UP” or “DOWN” used	Assign the missing digital signal to a second terminal
dF	Dynamic braking fault	Dynamic braking resistors are overheating	Increase deceleration time (C13)
EEr	External error	Digital input “TRIP set” is active	Remove external error
F2...F0, uF	Internal fault		Please contact Lenze
FC3	CAN communication timeout	Monitored CAN messages not received	• Check h48 for cause • Increase timeout settings • Check CAN wiring
FC5	CAN initialization failed	CAN controller failure	• Perform CAN reset (h58) • Cycle power
LC	Automatic start inhibited	c42 = 0	LOW-HIGH signal change at terminal 28

(1) The drive can only be restarted if the error message has been reset; see c70

Troubleshooting and fault elimination

Error		Cause	Remedy (1)
OC 1	Short-circuit or overload	Short-circuit	Find reason for short-circuit; check motor cable
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
		Acceleration time (C12) too short	• Increase acceleration time • Check controller selection
		Defective motor cable	Check wiring
		Internal fault in motor	Check motor
		Frequent and long overload	Check controller selection
OC2	Earth fault	Grounded motor phase	Check motor/motor cable
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current
OC6	Motor overload (I^2t overload)	Motor is thermally overloaded, due to: • impermissable continuous current • frequent or too long acceleration processes	• Check controller selection • Check setting of c20
OH	Controller overtemperature	Controller too hot inside	• Reduce controller load • Improve cooling
OU	Overvoltage on DC bus	Mains voltage too high	Check mains voltage
		Excessively short deceleration time or motor in generator mode	Increase deceleration time or use dynamic braking option
		Earth leakage on the motor side	Check motor/motor cable (separate motor from controller)
rSt	Faulty auto-TRIP reset	More than 8 errors in 10 minutes	Depends on the error
SF	Single phase fault	A mains phase has been lost	Check mains voltage

(1) The drive can only be restarted if the error message has been reset; see c70

Notes

Document
SC03B-en3

Lenze

AC Technology Corporation • 630 Douglas Street • Uxbridge, MA 01569 • USA
☎ +1 (508) 278-9100